

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A charged beam exposure for delineating patterns of a system on a substrate to describe the system in a logic expression, to convert the logic expression into a connection of standard cells, and to delineate patterns of the standard cells on the substrate, comprising:

a beam generation source generating a charged beam;

a Character Projection (CP) aperture having shaping holes of the charged beam having shapes of the standard cells;

standard cell library recording means for recording a standard cell library having an information configured for designing the pattern of the system by using the standard cells and first placement positions of the shaping holes on said CP aperture related to the standard cells corresponding to the shaping holes;

Character Projection (CP) aperture decision means for conducting logic synthesis for CP apertures using the standard cells corresponding to the shaping holes placed on first placement positions on respective CP apertures, and for selecting a CP aperture having a throughput higher than a desired throughput in delineating the patterns of the system on the substrate based on the standard cell library;

placement and routing means for calculating second placement positions of the standard cells on the substrate, the standard cells corresponding to the shaping holes provided on the selected CP aperture based on the standard cell library;

pattern data recording means for recording second placement positions of the standard cells on the substrate, the second placement positions associated with the standard cells corresponding to the first placement positions on the selected CP aperture;

a character select deflector irradiating the charged beam onto the shaping holes at the first placement positions on the selected CP aperture; and

an objective deflector irradiating the charged beam onto the second placement positions on the substrate.

2. (Original) An exposure as in claim 1, further comprising:

a first shaping aperture rectangularly shaping an irradiation pattern of the charged beam to said CP aperture.

3. (Original) An exposure as in claim 1, further comprising:

a demagnifying lens demagnifying the irradiation pattern of the electron beam on the substrate.

4. (Original) An exposure as in claim 1, wherein

said standard cell library recording means further records input and output positions of signals of the standard cells.

5. (Original) An exposure as in claim 1, wherein

said CP aperture further has an opening for a variable shaped beam (VSB).

6. (Original) An exposure as claimed in claim 1, wherein

the shaping holes have a shape of the standard cell having a higher frequency of use or a shape of the standard cell having a higher effect of reducing the number of shots by CP exposure than by VSB exposure.

7. (Currently Amended) An exposure pattern data generation apparatus for delineating patterns of a system on a substrate to describe the system in a logic expression, to convert the logic expression into a connection of standard cells, and to delineate patterns of the standard cells on the substrate, comprising:

Character Projection (CP) aperture creation means for creating CP apertures having shaping holes corresponding to the standard cells;

standard cell library recording means for recording a standard cell library having an information configured to designing the pattern of the system by using the standard cells and first placement positions of the shaping holes on said CP apertures related to the standard cells corresponding to the shaping holes;

Character Projection (CP) aperture decision means for conducting logic synthesis for the CP apertures using the standard cells corresponding to the shaping holes placed on first placement positions on the respective CP apertures, and for selecting a CP aperture having a throughput higher than a desired throughput in delineating the patterns of the system on the substrate based on the standard cell library used for exposure; and

placement and routing means for calculating second placement positions of the standard cells on the substrate, the standard cells corresponding to the shaping holes provided on the selected CP aperture based on the standard cell library; and

pattern data recording means for recording second placement positions of the standard cells on the substrate, the second placement positions associated with the standard cells corresponding to the first placement positions on the selected CP aperture.

8. (Original) An apparatus as in claim 7, further comprising:

VSB exposure data conversion means for converting data into data capable of being used by an exposure to conduct variable shaped beam (VSB) exposure to the standard cells which cannot be subject to exposure using the shaping holes.

9. (Original) An apparatus as in claim 7, wherein

said CP aperture decision means comprises:

standard cell extraction means for extracting the standard cells;

logic synthesis means for conducting synthesized logic using the extracted standard cells;

and

constraints and the like determination means for determining whether the logic synthesis satisfies a specification.

10. (Original) An apparatus as in claim 9, wherein

said CP aperture decision means further comprises:

CP aperture creation means for creating a new CP aperture if the CP apertures cannot satisfy the specification.

11. (Original) An apparatus as in claim 7, wherein
said placement and routing means calculates wiring routes among the placed standard cells.

12. (Original) An apparatus as in claim 7, further comprising:
first standard cell library recording means for recording magnitudes, functions and performances of the standard cells, an identification code of the CP aperture on which the shaping holes having the shapes of the standard cells are formed and the first placement positions, and for providing the recorded magnitudes, functions and performances of the standard cells, the identification code and the first placement positions to said CP aperture decision means.

13. (Original) An apparatus as in claim 7, further comprising:
second standard cell library recording means for recording shapes and magnitudes of outlines of the standard cells, positions of input and output signals, an identification code of the CP aperture on which the shaping holes having the shapes of the standard cells are formed and the first placement positions, and for providing the recorded shapes and magnitudes of the outlines of the standard cells, positions of the input and output signals, identification code and the first placement positions to said placement and routing means.

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14. (Original) An apparatus as in claim 13, further comprising:
pattern data recording means for recording the second placement positions, the identification code and wiring routes among the standard cells provided from said placement and routing means.

15. (Currently Amended) An exposure pattern data generation method for delineating patterns of a system on a substrate to describe the system in a logic expression, to convert the logic expression into a connection of standard cells, and to delineate patterns of the standard cells on the substrate, comprising:

creating Character Projection (CP) apertures having shaping holes corresponding to the standard cells;

recording a standard cell library having an information configured for designing the pattern of the system by using the standard cells and first placement positions of the shaping holes on said CP apertures related to the standard cells corresponding to the shaping holes;

conducting logic synthesis for the Character Projection (CP) apertures using the standard cells corresponding to the shaping holes placed at first placement positions on the respective CP apertures on the substrate based on the standard cell library;

selecting a CP aperture having a throughput higher than a desired throughput in delineating the patterns of the system on the substrate used for exposure from the CP apertures on the substrate based on the standard cell library; and

calculating second placement positions of the standard cells on the substrate, the standard cells corresponding to the shaping holes provided on the selected CP aperture on the substrate based on the standard cell library; and

recording second placement positions of the standard cells on the substrate, the second placement positions associated with the standard cells corresponding to the first placement positions on the selected CP aperture.

16. (Original) A method as in claim 15, further comprising:

converting data into data capable of being used by an exposure to conduct variable shaped beam (VSB) exposure to the standard cells which cannot be subjected to exposure using the shaping holes.

17. (Original) A method as in claim 15, wherein

said conducting logic synthesis for CP apertures using standard cells corresponding to shaping holes placed at first placement positions on the respective CP apertures comprises:

extracting the standard cells; and

conducting logic synthesis using the extracted standard cells, and

said selecting a CP aperture used for exposure from the CP apertures comprises:

determining whether the synthesized logic satisfies a specification.

18. (Original) A method as in claim 15, wherein

said conducting logic synthesis for CP apertures using standard cells corresponding to shaping holes placed at first placement positions on the respective CP apertures further comprises:

creating a new CP aperture if the CP apertures cannot satisfy the specification.

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19. (Original) A method as in claim 15, wherein
the calculating second placement positions of the standard cells on a substrate, the
standard cells corresponding to the shaping holes provided on the selected CP aperture further
comprises:

calculating wiring routes among the placed standard cells.

20. (Original) A method as in claim 15, further comprising:
recording magnitudes, functions, outline shapes and outline magnitudes of the standard
cells, positions of input and output signals, identification codes of the CP apertures on which the
shaping holes having the shapes of the standard cells are formed and the first placement
positions.

21. (Original) A method as in claim 15, further comprising:
recording the second placement positions, identification codes and wiring routes among
the standard cells.

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